

# Proposal for Special LArIAT Runs

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- Proposal duration: 4 hours with beam, 4 days without beam

As LArIAT Run I comes to a successful close, we would like to propose three special runs in order to better understand our beam and the capabilities of our experiment.

Date	Time	Run Configuration
7/3	Two Hours*	No Target
7/3	Two Hours*	Modified Collimator
7/4-7/5	All Day	Na-22
7/6	7:30am-3:00pm	Cf-252
beyond 7/6		Source Runs TBD

\*This includes installation/controlled access time.

## 1 Radioactive Source Runs

LArIAT would benefit from obtaining a pure sample of photons and neutrons. A short run with radioactive sources will help us to understand our opportunities and limitations for such measurements. The relevant sources for this run are below.

Isotope	Type	Source ID	Current Activity
Na-22	Gamma (Annihilation Radiation)	22-1.5-1	17.9 microCuries
Cs-137	Gamma (Internal Conversion)	137-3.1-69	725 microCuries
Cf-252	Neutron (Spontaneous Fission)	252-7.2-1	4.2 microCuries

### 1.1 Gamma Sources

The two relevant gamma sources are now in the Meson Detector Building source box. Dung Phan and Will Flanagan have a key to this source box and are certified to move these sources into place. They will be placed between MC7SC3 and the titanium window of the cryostat. Since Na-22 is an annihilation source, it produces back to back photons with an energy of 0.511 MeV. The Na-22 will be our first choice if we see a reasonable rate of events in the TPC. The trigger condition will be SC3 and LARSCINT.

Cs-137 does not provide simultaneous photons, but we could benefit from the higher rate and higher energy (0.624 MeV) of this source.

### 1.2 Neutron Sources

the Cf-252 source must be placed by an approved source technician. The first day of possible neutron source running is July 6. On days of neutron source running, the source will be delivered at 7:30am and picked up at 3:00pm. Kathy Graden is the Source Physicist who is preparing the Radioactive Work Permit.

The trigger condition will be LARSCINT. We have yet to demonstrate that our DQM can handle the high rate of this trigger.

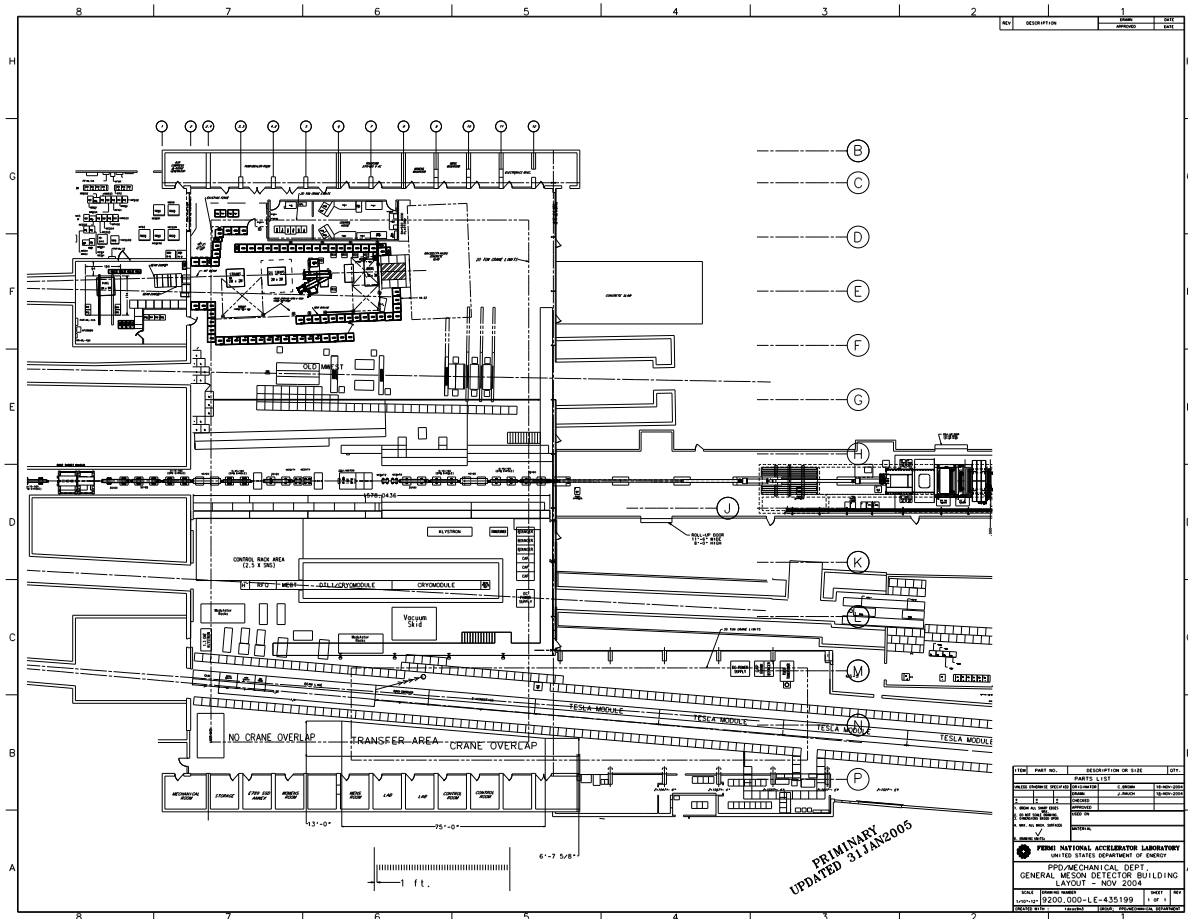


Figure 1: Layout of the Meson Detector Building.

## 2 No Target Running

As we look to improve understanding of both our secondary and tertiary beam, LArIAT would benefit from a short (1 hours) run with our target removed. This run will make use of the LARSCINT trigger.

Our copper target is a right parallelogrammatic prism 31.75 mm high and wide, measured transverse to incoming beam. The interaction length is 39mm. We will be requesting less than  $3e5$  counts on MC7SC1. We will make sure to have Gary Lauten's explicit approval before making any modifications to the target area.

## 3 Modified Collimator Running

Simulations suggest that by narrowing our downstream collimator, we are able to have a more narrow momentum spectrum incident on the TPC. By comparing the reconstructed momentum with and without this modification, we can test both beamline simulations and our momentum reconstruction algorithms.

Brandon Soubasis has prepared steel plates and clamps which can be slid into the collimator without moving or disturbing any beamline detectors. This allows us to narrow the collimator from 6" to 3.5".



Figure 2: View of the copper target from above and below, as seen by the secondary beam.

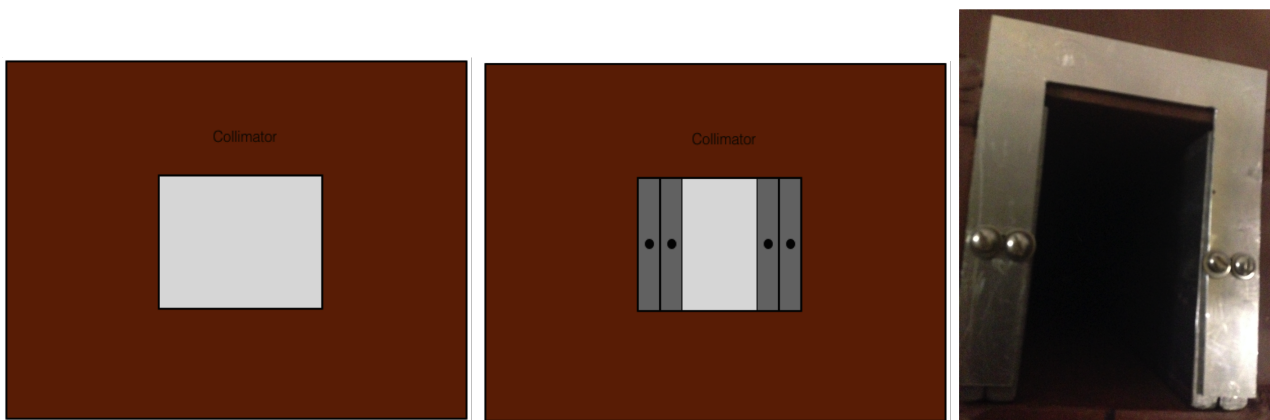


Figure 3: Left to Right: An illustration of the collimator with no additional steel plates, four steel plates, and a picture of four steel plates installed.